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10/786,443

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Wade Thomas Cathey JR.

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EXAMINER

YAM, STEPHEN K

ART UNIT

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2878

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/786,443 | Applicant(s) CATHEY ET AL. | |
| | Examiner STEPHEN YAM | Art Unit 2878 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 23 is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 8, 11 and 15 is/are rejected.
- 7) ☒ Claim(s) 5, 7, 9, 10, 12-14 and 16-22 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>11/11/2007</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. It is unclear whether the post processor recited in Claim 7 is integrated with the linearization processor in parent Claim 1 or is a separate component, as the post processor linearizes the immediate image to form a linearized image (as recited in Claim 7), but the processor in parent Claim 1 is recited as a linearization processor. Therefore, it is unclear which component performs the linearization or whether the two processors are actually a single processor.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 8, 11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Hammond, Jr. US 6,097,856 (hereinafter "Hammond").

Regarding Claim 1, Hammond teaches (see Fig. 2) a non-linear optical system for imaging an object (10) comprising: optics (22, 24) for focusing and encoding a wavefront from the object to an intermediate image such that an optical transfer function of the optical system, at the intermediate image, is more invariant to focus-related aberrations as compared to an intermediate image formed by the optics without encoding (see Col. 7, lines 25-35); a non-linear detector (30) (see Col. 8, lines 63-67) for detecting the intermediate image; and a linearization processor (40) for electronically capturing the intermediate image (see Col. 9, lines 1-7).

Regarding Claim 2, Hammond teaches the optics comprise a phase mask (see Col. 7, lines 23-30) that modifies the optical transfer function of the optical system by affecting phase of the wavefronts transmitted by the phase mask (see Col. 7, lines 23-30).

Regarding Claim 3, Hammond teaches the aberrations include one or more of misfocus (see Col. 7, lines 29-31), spherical aberration, astigmatism, field curvature, chromatic aberration, temperature induced misfocus aberration, and pressure induced misfocus aberration.

Regarding Claim 8, Hammond teaches a post processor for linearizing the electronically captured intermediate image to form a linearized image (proper gray scale image- see Col. 8, lines 54-56) and for removing effects of wavefront coding induced by the optics to form a final image (see Col. 9, lines 1-7).

Regarding Claim 11, Hammond teaches the non-linear detector comprising a non-linear digital detector (see Col. 8, lines 63-67 and Col. 4, line 43-45).

Regarding Claim 15, Hammond teaches (see Fig. 2) a method for reducing aberrations in a wavefront imaged by an optical system having a non-linear detector (30) (see Col. 8, lines 63-67), comprising: encoding (24) a wavefront of electromagnetic radiation from an object (10)

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imaged to the non-linear detector; digitally converting data from the non-linear detector to form a digital representation of the image captured by the detector (see Col. 4, lines 43-45); linearizing the detected image to form a linearized image (to provide a proper gray scale image- see Col. 8, lines 54-56); and filtering (see Col. 9, lines 1-7) the linearized image to reverse effects of wavefront coding to form a final image.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammond in view of O'Meara US 3,988,608.

Regarding Claim 4, Hammond teaches the device in Claim 1, according to the appropriate paragraph above. Hammond does not teach the non-linear detector comprising film. O'Meara teaches a similar non-linear optical system with a non-linear detector comprising film (see Abstract and Col. 2, lines 13-16 and Col. 2, lines 51-54 and Col. 2, line 66 to Col. 3, line 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the non-linear detector comprising film, as taught by O'Meara, in the device of Hammond, to provide incorporation of the device into existing optical systems and devices, as taught by O'Meara (see Col. 1, lines 51-54 and Col. 2, lines 14-17).

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8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammond in view of Siebert US 5,367,375.

Regarding Claim 6, Hammond teaches the device in Claim 1, according to the appropriate paragraph above. Hammond does not teach the optics comprise an optical element with an aspheric phase profile. Siebert teaches a similar device with optics comprising an optical element with an aspheric phase profile (see Col. 10, lines 53-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the optics comprising an optical element with an aspheric phase profile, as taught by Siebert, in the device of Hammond, to provide wavefront coding patterns that are optimized to correct focusing aberrations for a clearer image.

Allowable Subject Matter

9. Claim 23 is allowed over the prior art of record.

10. Claims 5, 7, 9, 10, 12-14, and 16-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

Regarding Claims 5 and 23, the invention as claimed, specifically in combination with the nonlinear detector having an intensity threshold, wherein any part of the intermediate image

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that is below the intensity threshold is not detected by the nonlinear detector, is not disclosed or made obvious by the prior art of record..

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

O'Meara US 3,980,879 teaches a similar device with a non-linear detector.

Chen et al. US 5,426,521 and Kitamura et al. US 6,937,381 teach wavefront correction with optics having appropriate optical transfer functions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHEN YAM whose telephone number is (571)272-2449. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571)272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Stephen Yam/
Primary Examiner, Art Unit 2878